WHAT IS CLAIMED IS:

1. An ion thrusting system, comprising:

an ionization membrane having at least one area through which a gas is passed, and which ionizes the gas molecules passing therethrough to form ions and electrons; and

an accelerator element which accelerates the ions to form thrust.

2. The ion thrusting system of claim 1 wherein the accelerator element is a cathode.

3. The ion thrusting system of claim 1 wherein a potential applied to said ionization membrane may be reversed to thrust ions in an opposite direction.

4. The ion thrusting system of claim 3 wherein said accelerator element is a first accelerator element which accelerates the ions to form thrust in a first direction and further comprising a second accelerator element for accelerating the ions to form thrust in a second direction.

5. The ion thrusting system of claim 1 wherein electrons stripped from ionized gas molecules are diverted in direction substantially opposite to the flow path of the ionized molecules.

6. The ion thrusting system of claim 1 wherein said accelerator element operates at a first polarity to cause thrust in a first direction and operates in a second polarity to cause thrust in said second direction.

7. The ion thrusting system of claim 1 further comprising:

a plurality of additional ionization membranes and accelerator elements, collectively forming thrust as a geometrically integrated mass momentum of all of said individual membranes and accelerators.

8. The ion thrusting system of claim 1 wherein said at least one areas of said ionization membrane includes an opening in the membrane with electrodes which are located closer than a mean free path of said gas.

9. The ion thrusting system of claim 1 wherein the ionization membrane has one of said areas.

10. The ion thrusting system of claim 1 wherein the ionization membrane has a plurality of said areas.

11. The ion thrusting system of claim 1, wherein said ionization membrane comprises: an ionizing device, comprising an insulating element having at least one opening, a first conductive electrode extending on a first surface of said insulating element at the at least one opening and a second conductive electrode extending on a second surface of the insulating element at the at least one opening, wherein said insulating element separates said first and second conductive electrodes at said at least one opening by a thickness less than the mean free path of the molecules within the gas being ionized.

12. The ion thrusting system of claim 11 wherein said first and second conductive electrodes are separated by less than 1 micron at the at least one opening.

13. The ion thrusting system of claim 12 wherein said first and second conductive electrodes are separated by less than 300 nm at the at least one opening.

14. The ion thrusting system of claim 13 wherein said first and second conductive electrodes are separated by less than 200 nm at the at least one opening.

15. The ion thrusting system of claim 14 wherein said first and second conductive electrodes are separated by approximately 50 nm at the at least one opening.

16. The ion thrusting system of claim 11 wherein the at least one opening tapers inwardly from the first surface of said insulating element to the second surface of said insulating element.

17. The ion thrusting system of claim 11 further comprising a substrate disposed between said first and second conductive electrodes for providing structural support.

18. The ion thrusting system of claim 11 wherein the at least one opening has a diameter approximately in the range of 2-3 microns.

19. The ion thrusting system of claim 11 wherein said first and second electrodes are formed of at least one of gold, chrome or titanium.

20. The ion thrusting system of claim 11 wherein said insulating element is formed of silicon nitride or alumina.

21. The ion thrusting system of claim 1 wherein said ionization membrane strips electrons from the ionized gas molecules and further comprises an electron accelerator to divert the electrons in substantially the same direction as the accelerated ions to maintain charge neutrality within the system.

22. The ion thrusting system of claim 21 wherein said electron accelerator generates an electric field and a magnetic field for linearly and rotationally accelerating the electrons.

23. The ion thrusting system of claim 11 further comprising at least one tubular member bonded to said ionization membrane enclosing at least one of the at least one opening receiving the propellant gas and for directing the expelled ions.

24. The ion thrusting system of claim 23 wherein said at least one tubular member is eutectically bonded to said ionization membrane.

25. The ion thrusting system of claim 23 wherein said at least one tubular member is formed of quartz.

26. The ion thrusting system of claim 23 further comprising a potential generation unit for applying a potential across the said first and second conductive electrodes.

27. The ion thrusting system of claim 26 wherein the potential applied by said potential generation unit may be reversed to thrust ions in an opposite direction.

28. The ion thrusting system of claim 27 wherein said accelerator element is a first accelerator element which accelerates the ions to form thrust in a first direction and further comprising a second accelerator element for accelerating the ions to form thrust in a second direction.

29. The ion thrusting system of claim 28 wherein said first accelerator element is configured to accelerate ions in a first direction when the polarity of the potential applied by said potential generation unit is a first polarity, and wherein said second accelerator element is configured to accelerate ions in a second direction when the polarity of the potential applied by said potential generation units is a second polarity.

30. The ion thrusting system of claim 1 wherein the system is under vacuum and further comprising a gas delivery source for delivering low-pressure gas to said ionization membrane.

31. The ion thrusting system of claim 30 wherein the delivered low-pressure gas molecules accelerate upon exposure to the vacuum to supersonic speeds while cooling.

32. The ion thrusting system of claim 31 wherein the accelerated gas molecules are ionized and generate a further vacuum across the ionization membrane.

33. A method of forming an ion thruster comprising:

forming a layer of thin dielectric material on a substrate that has a first specified thickness of a sufficient thickness to maintain structural integrity;

forming a first electrode on the first surface of said thin dielectric material, said first electrode being formed of a metal material;

forming at least one hole in said substrate;

forming a second electrode on a second surface of the substrate including the at least one holes, such that at least a portion of the second electrode is on a second surface of the thin dielectric material;

forming holes in the second electrode, thin dielectric material and the first electrode, which holes have side surfaces where the first and second electrodes are separated by a width of the thin dielectric material; and

forming a tubular thruster member perpendicular to said substrate and enclosing at least one hole for directing expelled ions.

34. The method of claim 33 wherein said thin dielectric material has a thickness which is less than the mean free path of the gas intended to be ionized.

35. The method claim 33 wherein the step of forming electrodes comprises depositing at least one of gold, chrome, or titanium.

36. The method of claim 33 wherein the step of forming a thin dielectric comprises depositing silicon nitride or alumna.

37. The method of claim 33 wherein said thin dielectric has a thickness less than 1 micron.

38. The method of claim 37 wherein said thin dielectric has a thickness less than 500 nm.

39. The method of claim 38 wherein said thin dielectric has a thickness less than 300 nm.

40. The method of claim 39 wherein said thin dielectric has a thickness of approximately 50 nm.

41. The method of claim 37 further comprising the step of applying a voltage less than 15 volts between said first and second electrodes to form a field between said first and second electrodes in the range of tens to hundreds of megavolts per meter.

42. The method of claim 33 wherein said forming holes in said first and second electrode and said thin dielectric material comprises ion-beam milling.

43. The method of claim 33 wherein the holes formed in said first and second electrodes and said thin dielectric material are approximately 2-3 microns in diameter.

44. A method comprising the steps of:

providing an ionization device having first and second electrodes spaced closer than the mean free path of molecules to be ionized;

applying a potential across the first and second electrodes to generate an ionization field to ionize the molecules; and

selectively diverting the ions to generate thrust.

45. The method of claim 44 further comprising the step of:

selectively diverting electrons stripped from the ionized molecules to maintain charge neutrality.

46. A method comprising the steps of:

providing an ionization device having two electrodes spaced closer than a mean free path of a molecule to be ionized;

applying a voltage having a positive polarity across the two electrodes to generate an ionization field to ionizes the molecules;

accelerating the ionized molecules to cause thrust in a first direction;

applying a voltage having a negative polarity across the two electrodes to generate an ionization field to ionize the molecules; and

accelerating the ionized molecules to cause thrust in a second direction.

47. An ion thrusting system, comprising:

a housing having at least one mounting surface;

a plurality of ionization devices mounted and disbursed across the at least one mounting surface, each of said ionization devices having first and second electrodes separated by a width less than the mean free path of molecules to be ionized;

an accelerator element for generating an electric field to accelerate ions generated by said ionization devices; and

a control unit for selectively generating ions at pre-determined ionization devices to control the direction of ion thrust.

48. The ion thrusting system of claim 47 wherein said accelerator element is coupled along a periphery of the at least one mounting surface.

49. An ion thrusting system, comprising:

ionization means having ionization electrodes spaced closer than a mean free path of a gas molecule being ionized, for ionized gas molecules passing therethrough to form ions; and

accelerator means for accelerating the ions to form thrust.